Efficiency measurement of air-core TETS considering common-mode current: Comparing the theoretical with measured values at 1 MHz

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Transcutaneous energy transmission systems (TETS) can transfer energy by electromagnetic induction between two coils placed face-to-face on each side of the abdomen or chest skin. Previously, an AC-AC energy transmission efficiency of TETS has been measured. However, a common-mode current that flows into the ground through the AC source and measuring equipment prevents an accurate efficiency measurement. In this paper, to reduce common-mode current, a common-mode choke coil (CMCC), uninterruptible power supply (UPS), and differential probes were used to measure the efficiency of TETS. The result of the experiment was that the common-mode current was measured to be 133.7 μA and the efficiency was 97.47 % when the transmitting frequency was 989.8 kHz; the theoretical efficiency was 98.13 %. Our results nearly agreed with the theoretical efficiency by reducing enough common-mode current.